Pure silicic acid and pure manganese oxide also are able to be reduced by means of carbon, and to be changed into silicon and manganese, but this requires such high temperature that they cannot be produced in furnaces heated with ordinary fuels. In spite of this the reduction of both the substances described is achieved also in these furnaces, if one is satisfied to obtain them (instead of in the pure condition) in combination with iron. In the presence of metallic iron, silica and manganese oxides are reduced by carbon so long as neither the reducing agent employed nor the solubility of the iron for the substances reduced is exhausted.

Should, nevertheless, the reduction be undertaken by solid or liquid reducing agents of a mixture of several of the substances named, the procedure becomes more complicated. Silicic acid and phosphoric acid are at high temperatures powerful acids which unite thorn solves in combination with bases which are stable at that heat, to which class iron and manganese oxides belong. The combination results generally under the temperature at which iron oxide and phosphoric acid are reduced. The resultant substances arc easily fusible and pass into the molten condition. They oppose thus another resistance to the reduction, than that of each of their constituents by itself, since a chemical compound only then admits of being reduced without the aid of another substance, if the conditions for the reduction of its entire individual constituents arc fulfilled.

Tims pure iron oxide in pure iron silicate can only bo converted into the metallic state if also it is possible to convert the silicic acid into silicon, and from pure manganese phosphate, phosphorus only can be reduced by a reducing agent if the temperature is high enough in order to also be able to produce metallic manganese.

The conditions of reduction become, therefore, in general more difficult if substances reach the reaction aono in the form of chemical compounds.

But one can vary the conditions of reduction if one adds to the substances which should react on one another further substances which determine chemical change. If to pure iron or manganese silicate, or phosphate, one adds lime which is a